Bitterroot Elk Project Progress Report Spring 2014

Montana Fish, Wildlife and Parks and the University of Montana recently completed the third and final year of a three-year project investigating the influence of predation, habitat, and nutrition on elk population dynamics in the southern Bitterroot Valley. During the third year of the study, we monitored cause-specific adult and calf elk survival. Adult mortalities included a combination of predation and non-predation, natural causes. Calf mortalities were primarily due to predation, and lion predation was the leading cause of



calf mortality. Fieldwork on this project ended on May 31, 2014. During the upcoming fall and winter, we will be working to complete analyses of the past three years of elk survival and movement data.

Adult Elk Monitoring – Year 3

During the winter of 2012-13, we captured 41 adult female elk in the south Bitterroot study area. As in previous winters, these elk were instrumented with GPS/VHF collars that collected GPS locations at 30-minute intervals. Each elk was monitored for 12 months, and collars were programmed to drop off one year after the date of deployment. Collared elk generally exhibited similar movement patterns to previous years, with a few notable exceptions. Of the 20 elk captured in the East Fork area, eight migrated to the upper Big Hole in early May. Six of these elk eventually returned to the East Fork in late fall 2013. One elk that summered in the Big Hole migrated to the Salmon River drainage in Idaho in late fall and spent the 2013-2014 winter along the North Fork of the Salmon River. This was the first collared elk from our study to emigrate and winter in Idaho. One elk that summered in the Big Hole moved north of Mud Creek in hunting district 319 in late fall and has not returned to the study area. We are continuing to search adjacent elk ranges to locate this animal.

Adult Elk Survival - Year 3

Of the 41 adult female elk that were monitored during 2013-2014, four died during the one year monitoring period. One West Fork elk was killed by a mountain lion in March 2013, one by an unknown predator in April 2013, and one other died of natural causes just after giving birth in early June 2013. One East Fork elk was hit by a vehicle while crossing highway 93 between Darby and Conner in November 2013. The Kaplan-Meier (KM) survival estimate for 2013 was 0.90. The estimated annual adult survival rate was 0.84 in 2011 and 0.95 in 2012.





Elk Calf Survival - Year 3

The third and final year of elk calf survival monitoring was completed on May 31, 2014. From May 27-June 16, 2013, project staff and volunteers captured newborn calves in the East and West Fork areas of the Bitterroot, and in the upper Big Hole Valley. Prior to the start of the calf capture, many of the radiocollared adult female elk migrated to the Big Hole, so we included this area in our capture efforts to mark calves from within the entire East Fork elk calving range.

We captured a total of 84 elk calves, 42 in the West Fork area and 42 in the East Fork and upper Bighole. After completing the summer monitoring, field staff monitored calves 2 to 3 times per week from fall to spring, and conducted detailed mortality investigations at each mortality site. A winter elk calf capture was not required this year due to higher calf survival and fewer ear tag failures. In total, 17 calves had unknown fates due to tag loss (n = 11) or unknown censoring events (n = 6). Of the 68 known-fate calves, 36 died and 31 lived. The cause-specific mortality rates were 0.18 for lion predation, 0.04 for bear predation, 0.09 for unknown predation, 0.15 for unknown causes, 0.03 for natural, non-predation, and 0.01 for human-related mortality. The natural, non-predation causes included drowning and starvation. The human-related mortality was due to hunter harvest. We did not detect any wolf predation.

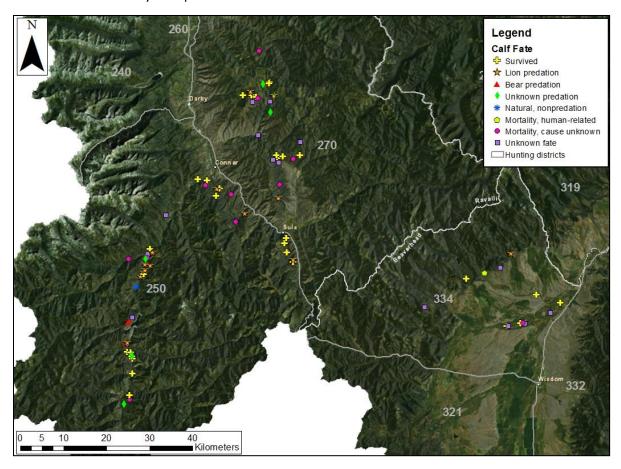


Figure 1. The location of 2013-2014 calf captures and associated fates within the southern Bitterroot Valley study area.





The KM survival estimate was 0.44 for calves in 2013-2014, the highest survival estimate among study years (2011 = 0.27, 2012 = 0.41). Overall, male calves had a 65.3% greater risk of mortality than females, and this difference did not depend on the study year. The KM survival estimates were 0.48 for females and 0.30 for males. The overall cause-specific mortality rates were 0.19 for lions, 0.04 for bears, 0.03 for wolves, 0.08 for unknown predator, 0.12 for unknown mortality, 0.04 for natural, non-predation, and 0.01 for human-related mortality.

Elk Habitat and Vegetation Monitoring

As part of the Bitterroot elk project, we are assessing elk forage availability and digestibility across the study area. This work has three main components; 1) Assessing *elk diet* during summer and winter by collecting elk pellet samples, 2) Assessing *elk forage biomass* availability across different landcover types during the peak of the growing

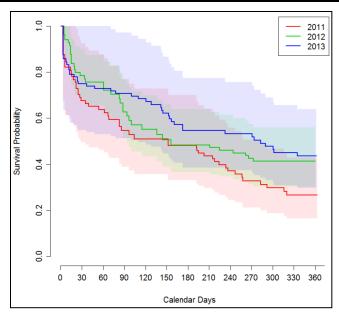


Figure 2. The probability of calf survival with 95% confidence bands from capture through age 1 during 2011 (red), 2012 (green), and 2013 (blue).

season in July/August, and 3) Assessing *elk forage quality and plant phenology* during the growing season from April to October. For all three-research components, plant samples have been under analysis from 2012 and 2013 at the Washington State University Wildlife Habitat Nutrition Lab.

Summer 2012 elk diet analyses from pellet samples show that graminoids were the most important part of the diet of elk during summer in both the east and west fork areas, followed by forbs (wildflowers), and shrubs (see Figure 3). Key forage species for elk included the following top 5 graminoids; Carex (sedge) species, Poa, Agropyron, Festuca, and Stipa; Forbs, Lupinus, Balsamorhiza, Xerophyllum, Achillea, and Equisetum; and Shrubs,

Mahonia, Shepherdia, Salix, Vaccinium and Symphoricarpos. Elk winter pellets and diet are currently being analyzed in the lab.

During 2012 and 2013 we sampled 236 vegetation plots during the peak of the growing season in 'biomass' plots. These locations were chosen using an adaptive, stratified-random sampling design based on landcover classes. Landcover classes included recent burns, agriculture and ranch land, seasonal wetlands, grasslands, and closed canopy forests. At these locations, we surveyed all vegetation along a 30 m transect, gathering information about both understory and overstory vegetation. We identified all species, measured shrub and tree density, and recorded other characteristics of

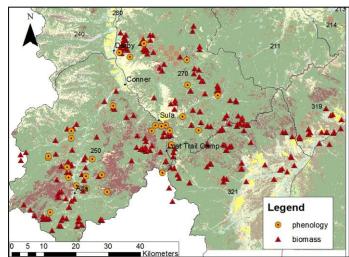


Figure 3. The location of biomass and phenology sampling areas.





each location, including landcover type. To sample biomass, we quantified ground cover classes within a 0.5 m² quadrat, then cut all live and dead vegetation within the quadrat. We weighed the sample in the field and then weighed it again after drying to quantify the amount of biomass in an area. These biomass data will be used to understand how the distribution of key elk plant species (from the diet analyses) is affected by different landcover types, including fire, and geographic gradients in elevation. We will then be able to predict the distribution of forage biomass for key forage plants for elk throughout the study area.

For all ungulates like elk, is not just the *amount* of food that is present, but *how digestible* the food is that determines the quality of forage. Digestibility is highest when plants first start growing, in wet years, at higher elevations, and different plant species (grasses, shrubs) have different digestibility. In particular, studies in the west have shown that digestibility of key elk forage species in the late summer and fall is critically important for elk. To estimate spatial and temporal variations in forage quality, we established 30 phenology plots stratified by key phonological drivers (elevation, open habitats) that we visited 3-6 times through the growing season from April 15 – October 15 in 2012 and 2013. Each time we visited the plot, we recorded the composition of the plant cover, identify all vegetative species present, record the phenophases of the vegetation (flowering, fruiting, etc.), and estimated biomass. We also collected over 1000 plant samples from the key species identified using diet analyses at each of the plant stages (new, fruiting, flowering, etc.). These plant samples are now being analyzed for digestibility so we can understand how plant forage quality specifically changes over the growing season, and whether there are differences in habitats in the timing and quality of key elk forage plants.

Future Project Plans

The 2011 - 2014 elk study estimated adult and calf survival rates and cause-specific mortality. We found mountain lion predation is an important factor affecting both adult and calf elk survival. This will provide baseline information regarding elk survival and cause-specific mortality rates in the Bitterroot Valley before regional changes in mountain lion management have taken effect. We plan to return to the Bitterroot study area in 2016-2017 to estimate both mountain lion density and cause-specific elk calf mortality, and evaluate the extent to which changes in mountain lion harvest management affected mountain lion density and elk calf recruitment rates.

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